region. This disturbance was a limited area and moved rapidly eastward over the Missouri and central Mississippi valleys, attended by light rains. It declined to the northeast after passing over the Lake region, the pressure decreasing at the centre, the disturbance becoming much more extended as it approached the Saint Lawrence Valley. It continued its northeasterly course during the 22d and 23d, followed by an area of high pressure which caused rapid increase in the barometric gradient in the southwest quadrant, and this was attended by strong southwesterly gales in the Saint Lawrence Valley.

IX and X.—These disturbances appeared in the region north of Montana, the former on the 25th and the latter on the 29th. Neither of these storms caused any marked change in the weather conditions in the regions east of the Mississippi during the month. Previous to the development of the storm traced as number ix, a disturbance appeared in the same locality on the 22d. The barometer fell to 29.12 at Swift Current, N. W. T., on the afternoon of the 22d, and at that date the indications were that the most severe storm of the month was slowly advancing eastward from the region north of Montana. A change in the direction of movement, however, carried this disturbance to the northeast before reaching Manitoba, and the centre of the disturbance could be only approximately located at three regular telegraphic reports, and it has therefore not been traced as an area of low pressure on chart i.

NORTH ATLANTIC STORMS FOR JUNE, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during June, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Five depressions have been traced for June, 1889; the average number traced for the corresponding month of the last six years being eight. Of the depressions traced for the current month, three were continuations of areas of low pressure which first appeared over the North American continent; one prevailed west of the British Isles during the earlier days of the month; and one first appeared north of the Bahamas. The West Indian hurricane which advanced northward from the Caribbean Sea during the second decade of the month is described as low area vii. Along the trans-Atlantic steamship tracks west of the Banks of Newfoundland unsettled weather, with moderate to fresh gales, prevailed from the 4th to 7th, 13th, 14th, 17th, and 20th to 23d, attending the passage of depressions to the northward. From the 15th to 19th a depression of moderate strength moved northward from the west portion of the Caribbean Sea over the eastern part of the Gulf of Mexico and thence northeastward off the coast of the United States, attended by fresh gales, save on the 18th, when central off the south Atlantic coast, when strong gales were reported. During the 24th and 25th fresh gales prevailed off the south Atlantic coast with the passage of a depression which apparently advanced from the north of the Bahamas and dissipated over the south Atlantic states. Over mid-ocean the month was characterized by low barometric pressure north of the trans-Atlantic steamship routes during a greater portion of the second and third decades, while south of the forty-fifth parallel the pressure continued generally high. These conditions occasioned fresh westerly winds along the steamship routes during the periods referred to. Over the eastern part of the ocean fair weather prevailed, except during a portion of the first decade. From the 1st to 4th a depression of considerable strength, with pressure falling to about 29.00 (736), was central west of the British Isles, attended by fresh to strong gales, which increased in force to whole gales on the 4th. From the 8th to 10th fresh north to west gales were reported south and east of the British Isles, attending the presence of a depression to the eastward.

The general character of the weather over the western part of the Caribbean Sea is indicated by the following report of Capt. Geo. S. Locke, commanding the steamship "Muriel": "The weather during June, 1889, in the Caribbean Sea, and particularly at the Windward Islands, has been unusually stormy, with extraordinary rainfall. On the Island of Dominica, on 'Shawford Estate,' the rainfall was 28.54 inches for eight consecutive days, with frequent squalls of hurricane violence. The total rainfall on the Island of Dominica for the month was 44.36 inches, and many of the other islands were not short of that amount. Much damage was done to plantations, roads, and bridges, owing to the swollen rivers and mountain streams. The trade winds during the month have been very strong, blowing from east to east-northeast, and attended with violent rain squalls and rough sea."

Compared with the corresponding month of previous years the storms of the north Atlantic were deficient in number and energy. The storms traced for June in preceding years have varied in number from three, in 1883, to fourteen, in 1886. Severe storms are unusual in the middle latitudes of the north Atlantic during this month, and those of tropical or subtropical origin seldom acquire destructive strength. Among notable storms for June may be mentioned those of the first decade of that month in 1885, one of which advanced eastward over Nova Scotia and Cape Breton Island during the 1st and 2d, causing considerable damage to shipping and other property. The other passed eastward from the New Jersey coast during the 5th, and thence eastward to the Grand Banks by the 7th. This storm was especially severe along the Newfoundland coast, and was considered the most disastrous that had visited the island in forty years. It was estimated that more than fifty vessels were totally wrecked, while a large number were driven ashore and seriously damaged.

The following are brief descriptions of the depressions traced for June, 1889:

1.—This depression was central in about N. 56°, W. 24°, on the 1st, with central pressure about 29.00 (736), and fresh and strong north to west gales to the fortieth meridian. By noon, Greenwich time, of the 2d the depression had apparently changed its position but slightly. By the 3d it had moved southward to about N. 51°, W. 20°, from which position it recurved northward to the fifty-sixth parallel by the 4th, after which it disappeared beyond the region of observation. This depression showed the lowest barometric pressure, and occasioned the strongest gales of the month.

2.—This depression was a continuation of low area iv, and passed eastward from the Gulf of Saint Lawrence over Newfoundland during the 14th, and thence northeastward over the ocean by the 15th, after which it passed north of the region of observation. This storm possessed moderate strength during its passage over Newfoundland, but apparently increased in energy after the 14th.

3.—This depression advanced rapidly northeastward over the Gulf of Saint Lawrence and Newfoundland during the 17th, with pressure below 29.70 (754), and on the morning of the 18th was central in about N. 55°, W. 45°, after which it disappeared north of the region of observation with an apparent increase in energy.

4.—This depression was a continuation of low area vi, and advanced eastward over the Gulf of Saint Lawrence during the 20th, with pressure below 29.40 (747), and fresh gales along the American coast. On the morning of the 21st the depression was central north of Newfoundland, attended by fresh to strong gales over the Grand Banks; by the following

date the centre of disturbance had advanced over mid-ocean to about latitude N. 54°, and at noon, Greenwich time, of the 23d it was central in about N. 57°, W. 28′, after which it passed north of the region of observation.

5.—The presence of a disturbance off the south Atlantic coast north of the Bahamas was shown by reports of the 24th, and reports from land stations indicate that the disturbance moved northwestward over the south Atlantic coast and dissipated. This depression was feeble, and its presence and passage were shown by wind directions and moderate to fresh gales in the region it traversed.

FOG IN JUNE.

The following are limits of fog-areas on the north Atlantic Ocean during June, 1889, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
1	41 43	66 05	41 37	66 32	14	49 59	43 14	49 31	44 27
2	42 08	55 48	42 23	54 02	15-16	47 25	59 10	48 48	63 20
2-3	43 48	56 05	43 08	60 00	15-16	42 29	63 40	140 miles east of Boston Light.	
5	49 10	47 20	6 miles off Saint John's, N. F.		15-16	44 05	63 02	Halifax.	
5	47 09	40 34	46 29	42 00	16-17	43 40	49 10	45 10	45 00
5-6	43 24	51 44	42 55	54 30	16-17	43 00	63 00	42 38	68 00
6-7	44 23	46 18	42 48	51 30	16-17	44 24	56 24	43 21	59 20
7-8	42 30	52 00	43 36	47 24	16-17	41 40	61 40	40 31	69 20
8	42 28	48 20	42 11	47 45	17-18	43 02	57 15	42 56	59 53
8-9	44 40	46 30	43 12	50 30	17-18	44 46	45 57	43 16	49 33
9	43 00	48 18	42 36	49 56	19-20	40 56	67 10	40 30	70 40
9-10	46 40	58 00	49 00	65 00	19-20	40 44	69 31	42 12	69 55
10	Delaware Light-Ship.		Off Long Branch.		19-20	Halifax.			
					19-20	40 15	70 30	40 13	68 00
10	52 48	51 43	52 22	53 20	20	40 32	66 43	40 29	70 00
10-11	43 29	49 23	45 10	44 08	20	38 50	74 35	38 35	74 32
11	41 30	65 48	40 28	69 44	20-21	46 45	51 41	46 00	53 10
11	52 00	52 00	51 00	52 00	21-22	40 58	68 54	40 34	72 08
11-12	41 03	66 10	40 41	70 04	22	43 11	51 53	42 49	54 31
11-12	42 41	63 00	42 30	68 45	22	40 52	65 35	40 40	69 37
11-12	40 45	66 30	40 27	68 46	22-23	44 05	43 16	43 55	50 45
11-12	Canso Roads.		44 45	61 31	22-23	Off Sambro Island.		44 04	63 02
12-13	42 38	50 43	44 08	45 51	23	41 36	50 08	41 32	50 29
12-13	40 43	66 30	40 34	70 12	26	40 30	69 03	40 29	70 15
12-13	48 18	43 38	45 31	50 16	26	41 35	69 05	Off Cape Cod.	
12-14	47 40	43 00	44 55	50 00	27	42 24	56 00	42 25	54 30
12-14	49 18	43 15	46 30	53 10	27-29	47 44	49 42	48 03	61 25
13	42 40	64 45	42 40	63 30	28-30	42 05	65 40	42 56	*67 04
13-14	44 19	44 24	42 30	51 16	29	42 18	65 34	Off Cape Cod.	
13-14	50 17	43 58	48 20	48 32	29	40 40	68 09	40 27	72 47

*Fog continued to close of month.

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on nineteen dates, as compared with fifteen dates for May, 1889, and twenty-three dates for June, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported on eighteen dates, as compared with fifteen dates for May, 1889, and twelve dates for June, 1888. West of the sixty-fifth meridian fog was reported on fifteen dates, as compared with twenty dates for May, 1889, and eighteen dates for June, 1888. Compared with the preceding month there has been an increase in fog frequency over or near the Grand Banks and to the southward of Nova Scotia, while to the westward of the sixty-fifth meridian fog was less frequently encountered than during the preceding month. East of the fifty-fifth meridian fog was generally reported with the presence or passage of areas of low pressure over New England, the Canadian Maritime Provinces, or the Gulf of Saint Lawrence. On a number of dates, however, fog developed with southerly winds attending low barometric pressure to the northward of Newfoundland and the Grand Banks. In the vicinity, and to the southward, of Nova Scotia fog was generally reported with the approach or passage of areas of low pressure to the northward. On several dates it was encountered in that region with southerly winds and low barometric pressure to the north of the Gulf of Saint Lawrence. Off the coast of the United States fog was reported on six dates with areas of low pressure central near or off the coasts of the United States or Nova Scotia, or over the Gulf of Saint Lawrence, and on nine dates with high barometer, south to east winds, and unsettled weather.

OCEAN ICE IN JUNE.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for June during the last seven years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
June, 1883	40 28	51 45	June, 1883	48 14	42 43
June, 1884	40 42	47 49	June, 1884	44 00	45 23
June, 1885	39 38	48 12	June, 1885	45 14	41 12
June, 1886	40 30	53 00	June, 1886	49 15	40 00
June, 1887	40 40	48 34	June, 1887	43 22	39 19
June, 1888	43 38	43 24	June, 1888	43 38	43 24
June, 1889	42 54	49 54	June, 1889	46 57	40 29

In June, 1889, the southernmost ice reported was about two degrees north of the average southern limit, and the easternmost ice noted was about one and one-half degrees east of the average eastern limit of ice for the month. Ice was most frequently encountered along the east and north edge of the Banks of Newfoundland, and from Belle Isle eastward to the fifty-first meridian. Reports have been received from several steamships that effected the passage of Belle Isle Straits; this route being closed to navigation by ice during the preceding months of the year. Compared with the corresponding month of preceding years the aggregate quantity of Arctic ice reported for June, 1889, corresponded closely with the average for the month. Compared with May, 1889, the southern limit for the current month was about one degree farther south, while the extreme eastern limit was about four degrees farther west.

The following positions of icebergs and field ice reported are shown on chart i by ruled shading:

1st.—N. 47° 00′, W. 46° 11′ to N. 46° 40′, W. 47° 00°, two bergs and one piece of ice; N. 48° 26′, W. 48° 55′, several large bergs and field ice.

2d.—N. 48° 04′, W. 48° 20′, four small and one medium bergs; N. 46° 45′, W. 41° 14′, a large berg about 400 to 500 feet long and 150 feet high; N. 46° 30′, W. 42° 00′, a large berg; N. 46° 53′, W. 45° 04′ to N. 47° 16′, W. 43° 04′, a medium and two small bergs.

3d—N. 46° 57′, W. 40° 29′, a large berg about 100 feet high and one-half mile long; N. 46° 43′, W. 40° 34′, a berg about 60 feet high and 400 feet long, and several detached pieces.

4th.—N. 44° 08′, W. 47° 55′, a small berg; N. 44° 08′, W. 48° 02′, a berg 40 to 50 feet high and one-fourth mile long; N. 47° 49′, W. 50° 23′ to N. 48° 27′, W. 48° 52′, twenty bergs of various sizes.

4–5th.—N. 53° 05′, W. 51° 10′ to N. 52° 56′, W. 53° 40′, numerous bergs.

7th.—N. 48° 00′, W. 49° 30′, several small pieces of ice.

8th.—N. 47° 47′, W. 49° 02′, a large berg ten miles distant.

9th.—N. 43° 50′, W. 49° 00′, a small berg; N. 48° 14′, W. 48° 31′, a long low berg; N. 43° 13′, W. 49° 44′, several pieces of floe ice; N. 48° 22′, W. 47° 46′, a small flat berg one-half mile distant; N. 48° 26′, W. 47° 57′, a large berg.

10th.—N. 52° 34′, W. 52° 45′, several bergs in sight.

10–11th.—N. 52° 00′, W. 51° 00′, numerous bergs, packed, and field ice.

11th.—N. 42° 54′, W. 49° 54′, a large berg; N. 52° 10′, W. 46° 27′, two bergs; N. 48° 05′, W. 47° 50, two large and one small bergs.

13th.—N. 48° 15′, W. 46° 50′, five bergs; N. 46° 12′, W. 47° 04′ a large berg.

14th.—N. 48° 37′, W. 47° 24′, a small berg; N. 48° 16′, W. 47° 52′, a large berg; N. 48° 11′ W. 48° 50′, a large berg.

15th.—N. 44° 10′, W. 48° 10′, a large berg; N. 44° 38′, W. 47° 41′, a berg 200 feet high and 400 feet long; N. 44° 24′, W. 48° 30′, a berg 250 feet high and 400 feet long; N. 43° 55′, W. 48° 23′, a medium sized berg; N. 42° 56′, W. 49° 38′, two large and four medium sized bergs; N. 43° 36′, W. 48° 24′, two

large bergs six or seven miles to northward; N. 48° 35′, W. 48° 15′, one large and one small berg; N. 43° 21′, W. 48° 44′, two large bergs and six small detached pieces.

16th.—N. 52° 50′, W. 52° 03′, six large bergs within five miles; N. 52° 37′, W. 53° 21′, one very long flat berg; N. 51° 54′, W. 55° 00′, twelve large and small bergs; three bergs a little south of Belle Isle; N. 43° 32′, W. 48° 22′, a moderate sized berg seven miles distant; N. 43° 24′, W. 48° 44′, a moderate sized berg; N. 44° 15′, W. 48° 30′, a large berg; N. 52° 49′, W. 51° 45′, a large number of bergs, large and small.

18th.—N. 47° 37′, W. 46° 28′, a small berg; N. 43° 51′, W. 48° 10′, berg five miles distant; N. 49° 57′, W. 49° 45′, a berg.

19th.—N. 45° 19′, W. 47° 17′, six large bergs and nineteen small pieces and flakes of ice; N. 45° 05′, W. 48° 10′, a large berg and three small pieces of ice; N. 42° 57′, W. 48° 15′, a berg 45 feet high and 170 feet long; N. 48° 18′, W. 45° 57′ to N. 47° 30′, W. 47° 50′, large and small bergs and pieces of ice.

20th.—N. 44° 13′, W. 48° 27′, a berg about 130 feet high and 975 feet long; N. 43° 13′, W. 48° 02′, a small berg.

26th.—N. 48° 55′, W. 52° 53′, a berg 200 to 300 yards long.

27th.—N. 48° 42′, W. 47° 08′, a large berg.

28th.—N. 53° 10′, W. 51° 10′ to Belle Isle, passed upwards of one hundred and fifty bergs.

29th.—N. 53° 00′, W. 51° 15′ to Belle Isle, numerous bergs of various sizes.

Capt. Jas. McAuley, of the s. s. "Toronto," reports relative to ice off the north and east coasts of Newfoundland as follows: "June 10th, in N. 52° 10′, W. 54° 00′, passed a large number of small icebergs and quantities of field ice, and came up to a solid barrier of field ice, so compact as to render it impossible to proceed farther towards Belle Isle. Ran ship twenty-five miles to northward, but could find no break in the ice, then kept to southward for Cape Race. Passed many large bergs from N. 52° 35′, W. 54° 00′ to Cape Race. Last bergs, two very large ones, in N. 47° 30′, W. 52° 25′." Capt. Joseph Wall, of the s. s. "Montreal," reports that on June 16th and 17th, from N. 51° 52′, W. 55° 10′, westward through the Straits of Belle Isle, no icebergs or field ice were seen.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for June, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

In June, 1889, the mean temperature was highest in the lower valleys of the Gila and Colorado Rivers, where, at stations in adjoining parts of Arizona and California, and in the extreme southern part of Nevada, it rose above 90°, the highest mean value, 92°, being reported at El Dorado Canyon, Nev. At stations in the west valley of the Sacramento River, and within an area extending from Kern county northward over the east portions of Tulare and Fresno counties, Cal., the mean temperature was above 85°. The mean readings were above 80° over the extreme southern and southwestern portion of Florida, at stations on the west Gulf coast, in the Rio Grande Valley, southwestern Arizona, extreme southern Nevada, and at stations in southeastern, east-central, and north-central California. The lowest mean temperature was reported in central Colorado, where at stations the values fell below 50°. In the lower valley of the Saint Lawrence River the mean readings were below 55°, and the values were below 60° at the more northern stations in the Lake region, at Bandon, Oregon, and on the coast of Washington Territory.

From the Pacific coast eastward over the plateau regions, except in southern California and southern Arizona; along the northern boundary of the United States and in adjoining parts of British America west of the ninety-fifth meridian, and on the Atlantic coast north of the fortieth parallel the mean temperature was above the normal. In all other portions of the country, embracing districts from the Lake region and upper Missouri valley southward to the Gulf of Mexico and the Rio Grande Valley, and in the Saint Lawrence Valley, the month was cooler than the average June. The most marked departures above the normal temperature were reported in northern and east-central California, Nevada, north-central Montana, the British Possessions lying north of Montana and Dakota, and in eastern New Brunswick and eastern Nova Scotia, where they were more than 5°. The departures below the normal nowhere amounted to 5°, save in northern Louisiana and Indian Territory.

Considered by districts, the greatest average departure above the normal temperature occurred on the middle Pacific coast, where it was 2°.6; in the middle plateau region the average departure above the normal was 2°.4; on the north Pacific coast 2°.1; in the northern plateau region, 2°.0; in New England, 1°.4; in the southern plateau region, 1°.1, and on the north Pacific coast, 0°.4. The greatest average departure below the normal, 4°.6, occurred over the southeastern slope of the Rocky Mountains; the average departures varied between 2°.0 and 4°.0 in Florida, the east and west Gulf states, Ohio Valley, lower lakes, upper Mississippi valley, and the middle-eastern slope of the Rocky Mountains, and in the middle and south Atlantic states, Rio Grande Valley, extreme northwest, Missouri Valley, and on the south Pacific coast they were less than 2°.0.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Winnemucca, Nev.	6.6	Shreveport, La.	5.2
Fort Assinniboine, Mont	6.6	Fort Sill, Ind. T.	5.1
Winnipeg, Manitoba	6.0	Saint Louis, Mo.	4.4
Chatham, N. B.	6.0	Little Rock, Ark.	4.4
Eureka, Cal.	5.7	Alpena, Mich.	4.4

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for June, 1889; (4) the departure of the current month from the normal; (5) and the extreme monthly means for June during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of June.	(2) Length of record.	(3) Mean for June, 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for June.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°		°	
Lead Hill	Boone	76.8	7	74.9	−1.9	80.2	1885	74.9	1889
California.									
Sacramento	Sacramento	70.3	36	67.8	−2.5	77.0	1853	65.6	1860
Colorado.									
Fort Lyon	Bent	74.1	20	69.0	−5.1	79.3	1881	69.0	1889
Connecticut.									
Middletown	Middlesex	66.5	22	67.0	+0.5	72.6	1876	62.9	1863